forming a beam;

at a first beamline location, modifying the beam to produce a modified intensity profile having a spatial intensity variation;

at a second beamline location downstream of the first beamline location, detecting the spatial intensity variation in the modified intensity profile; and

determining a beam direction or parallelism based on relative positions of the spatial intensity variation in the modified intensity profile at the first and second beamline locations.

REMARKS

Claims 1-25 are pending. By this amendment, claims 1, 7-11, 14 and 15 are amended, and new claim 25 is added.

I. Claim 23 is Fully Supported by the Specification.

Page 2 of the March 19, 2002 Office Action (the Office Action), rejects claim 23 under 35 U.S.C. §112, first paragraph. As pointed out in the first paragraph of the Remarks section on page 3 of the December 13, 2001 Amendment, support for claim 23 may be found, for example, at page 12, lines 12-14. This portion of the specification states "it should be understood that a direction of a beam 6 and a parallelism of a beam 6 can be determined in three dimensions, if desired, by applying the same principles described above in three dimensions." This portion of the application clearly indicates that direction and parallelism of a beam can be determined in three dimensions.

Accordingly, claim 23 is fully supported by the specification. Withdrawal of the §112, first paragraph, rejection of claim 23 is requested.

II. Claims 1-25 Define Patentable Subject Matter

Page 3 of the Office Action rejects claims 1-22 and 24 under 35 U.S.C. §102(b) as anticipated by US Patent 4,980,562 to Berrian et al. This rejection is respectfully traversed.

Applicant respectfully submits that Berrian does not teach or suggest all of the features of independent claims 1, 11, 14 and 15. For example, claim 1 recites determining a direction or parallelism of a beam relative to a reference direction in response to detecting a distance in at least one dimension between a position where at least one variation in intensity is detected and

the first position where the adjusted intensity profile is formed. Berrian does not teach or suggest determining a direction or parallelism of a beam in any manner, much less determining a direction or parallelism in response to detecting a distance in at least one dimension between a position where at least one variation in a portion of the beam is detected and a first position where an adjusted intensity profile is formed.

With respect to claim 11, Berrian does not teach or suggest identifying a position where a shadow is formed separate from and downstream of a beam modifier and determining a direction or parallelism of the ion beam in response to detecting a distance between the position of the shadow and the position of the beam modifier. Berrian does not detect any distance between a beam modifier and a position where a shadow is formed by the beam modifier. Moreover, Berrian does not teach or suggest determining a direction or parallelism of the beam in response to a detected distance between the shadow and the beam modifier.

With respect to claim 14, Berrian does not teach or suggest means for detecting an intensity profile of at least a portion of a beam downstream of a first position at a second position that is variable in distance from the first position in accordance with changes in direction or parallelism of the beam relative to a reference direction, and means for determining a direction or parallelism of the beam relative to a reference direction in response to detecting a distance between a position of the detected intensity profile and a position where the adjusted intensity profile is formed. Likewise, Berrian does not teach or suggest a controller that determines a direction or parallelism of a charged particle beam relative to a reference direction in response to a detected distance in at least one dimension between a position where an intensity profile is detected and a position where a beam modifier created the detected intensity profile, as set forth in claim 15. Berrian makes no mention of detecting any distance between a position where a beam is modified, e.g., where a portion of the beam is blocked, and another position where an intensity profile or variation in intensity is detected. Not only does Berrian not disclose detecting any such distance, Berrian does not disclose determining a direction or parallelism of a beam in response to a detected distance.

Accordingly, claims 1, 11, 14 and 15, and claims 2-10, 12-13 and 16-24 which depend from claims 1, 11 and 15, are allowable. Withdrawal of the §102 rejection of these claims is requested.
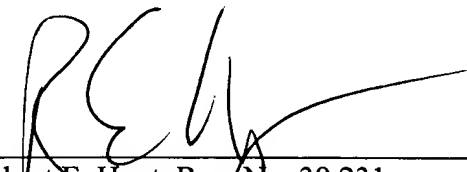
III. <u>Conclusion</u>

Applicant submits that this application is in condition for allowance. Favorable consideration and prompt allowance of claims 1-25 are requested.

Should the Examiner believe that anything further is desirable to place the application in better condition for allowance, the Examiner is invited to contact the Applicant's undersigned representative at the telephone number listed below.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicant hereby requests any necessary extension of time. If there is a fee occasioned by this response, including an extension fee that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50/0896.

Respectfully submitted,

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X07/19/02

Marked-up Claims

1. (Twice Amended) A method for determining a direction or parallelism of a beam, comprising:

   forming a beam;

   forming an adjusted intensity profile from at least a portion of the beam at a first position;

   detecting [an intensity profile of at least a portion of the beam] <u>at least one variation in intensity in the adjusted intensity profile</u> downstream of the first position; and

   determining a direction or parallelism of the beam relative to a reference direction [based on] <u>in response to detecting a distance in at least one dimension between</u> a position [of the detected intensity profile relative to a] <u>where the at least one variation in intensity is detected and the first</u> position where the adjusted intensity profile is formed.

7. (Amended) The method of claim 1, wherein the step of detecting [an] <u>at least one variation in</u> intensity [profile] comprises:

   providing at least one detector downstream of the first position; and

   detecting a change in beam intensity downstream of the first position with the detector.

8. (Amended) The method of claim 1, wherein the step of detecting [an] <u>at least one variation in</u> intensity [profile] comprises:

   moving a detector in a direction transverse to the beam direction; and

   detecting a change in beam intensity that corresponds to the adjusted intensity profile.

9. (Amended) The method of claim 1, wherein the step of determining a direction or parallelism comprises:

   identifying a first position where an adjusted intensity profile that caused [the] <u>a</u> detected minimum intensity [profile] was created;

   identifying a second position where [a] <u>the</u> minimum intensity [profile] is detected; and

determining a direction or parallelism of the beam based on the first and second positions relative to the reference direction.

10. (Amended) The method of claim 1, further comprising:

forming a second adjusted intensity profile from at least another portion of the beam at a second position;

detecting a second variation in intensity [profile] of at least another portion of the beam downstream of the second position; and

determining a direction or parallelism of the beam based on the positions of the detected intensity profiles relative to the positions of the first and second adjusted intensity profiles.

11. (Amended) A method for determining a direction or parallelism of an ion beam, comprising:

forming an ion beam;

blocking a portion of the beam with a beam modifier;

identifying a position where a shadow is formed [by] separate from and downstream of the beam modifier; and

determining a direction or parallelism of the ion beam [based on] in response to detecting a distance between the position of the shadow [relative to] and the position of the beam modifier.

14. (Twice Amended) An apparatus for determining a direction or parallelism of a beam, comprising:

means for forming a beam;

means for forming an adjusted intensity profile from at least a portion of the beam at a first position;

means for detecting an intensity profile of at least a portion of the beam downstream of the first position at a second position that is variable in distance from the first position in accordance with changes in direction or parallelism of the beam relative to a reference direction; and

means for determining a direction or parallelism of the beam relative to a reference direction [based on] <u>in response to detecting a distance between</u> a position of the detected intensity profile [relative to] <u>and</u> a position where the adjusted intensity profile is formed.

15. (Twice Amended) An apparatus for determining a direction or parallelism of a charged particle beam, comprising:

at least one detector that detects an intensity profile of at least a portion of the charged particle beam;

a beam modifier that alters an intensity profile of at least a portion of the charged particle beam upstream of the at least one detector; and

a controller that determines a direction or parallelism of the charged particle beam relative to a reference direction [based on] <u>in response to a detected distance in at least one dimension between</u> a position where the intensity profile is detected by the at least one detector and a position where the beam modifier created the detected intensity profile.